

**CLAIMS**

1. A portable measuring device comprising:
  - a housing;
  - 5 power supply means;
  - a processor and one or more motion sensors adapted to provide a measure of the relative spatial separation of at least first and second locations;
  - a user actuated trigger for identifying at least said first location; and
  - 10 a display for visually presenting information on a measured relative spatial separation

characterised in that said one or more motion sensors detect motion in six degrees of freedom and said processor is adapted to determine at least one angle as a measure of said relative spatial separation for presentation by said display.
- 15 2. A portable measuring device as claimed in claim 1, wherein said processor is adapted to determine said at least one angle with respect to one or both of vertical and horizontal planes.
- 20 3. A portable measuring device as claimed in claim 2, wherein said processor is adapted to determine whether said first and second locations are level with respect to either of said vertical or horizontal planes.
- 25 4. A portable measuring device as claimed in any one of the preceding claims, wherein said processor is adapted to determine, in addition to said at least one angle, a linear distance separating said first and second locations.
5. A portable measuring device comprising:
  - a housing;
  - power supply means;
  - 30 a processor and one or more motion sensors adapted to provide a measure of the relative spatial separation of at least first and second locations;
  - a user actuated trigger for identifying at least said first location; and
  - a display for visually presenting information on a measured relative spatial separation

characterised in that said processor is adapted to determine at least one angle and a linear distance as a measure of said relative spatial separation for presentation by said display.

- 5     6.     A portable measuring device comprising:  
         a housing;  
         power supply means;  
         a processor and one or more motion sensors adapted to provide a measure of  
the relative spatial separation of at least first and second locations;  
10          a user actuated trigger; and  
         a display for visually presenting information on a measured relative spatial  
separation

         said measuring device being characterised by further including a measuring  
point provided on said housing having a defined spatial relationship with respect to  
15     said one or more motion sensors, said measuring point being provided for  
identification to said processor, in association with said user actuated trigger, at least  
one of said first and second locations.

- 20     7.     A portable measuring device as claimed in claim 6, wherein said measuring  
point is visually distinguishable on said housing and user alignable with a user  
selected spatial location.

- 25     8.     A portable measuring device as claimed in either of claims 6 or 7, wherein  
said measuring point is adapted to be substantially stationary when aligned by a user  
with a selected spatial location.

- 30     9.     A portable measuring device as claimed in claim 8, wherein processor is  
adapted to determine an error correction when said measuring point is aligned with a  
selected spatial location and is substantially stationary, in relation to motion detected  
by said one or more motion sensors.

10.     A portable measuring device as claimed in any one of claims 5 to 9, wherein  
said one or more motion sensors detect motion in six degrees of freedom.

11. A portable measuring device as claimed in any one of the preceding claims, wherein the processor is in communication with a volatile memory in which is stored calibration data.

5 12. A portable measuring device as claimed in claim 11, wherein the processor is adapted to update calibration data stored in said volatile memory at a second or subsequent location.

10 13. A portable measuring device as claimed in claim 12, wherein said processor is adapted to adjust for movement of the one or more motion sensors as a result of uncontrolled hand movements of the user when updating calibration data stored in said volatile memory.

15 14. A portable measuring device as claimed in any one of the preceding claims, comprising a plurality of motion sensors wherein one or more of said plurality of motion sensors comprises an inertial measuring device.

20 15. A portable measuring device as claimed in any one of the preceding claims, comprising a plurality of motion sensors consisting of at least three accelerometers and three angular rate sensors.

25 16. A portable measuring device as claimed in any one of the preceding claims, further comprising a memory associated with said processor in which is stored instructions for calculating, in dependence on information generated by said one or more motion sensors, said measure of relative spatial separation.

30 17. A portable measuring device as claimed in any one of the preceding claims, wherein said housing includes thermal insulation to protect the one or more motion sensors within the housing from variations in external temperature.

18. A portable measuring device as claimed in any one of the preceding claims, further including a timer, in communication with the processor, for monitoring the time duration of a measurement wherein the processor is adapted to determine the

measure of relative spatial separation to a resolution dependent upon the time duration of the measurement.

19. A portable measuring device as claimed in any one of the preceding claims,  
5 wherein the processor is adapted to determine from information received from the motion sensors when the measuring device is stationary and to generate an error correction.

20. A portable measuring device as claimed in any one of the preceding claims,  
10 wherein the processor has access to threshold data identifying lower limits of measurable spatial movement representative of small, uncontrolled hand movements of a user.

21. A portable measuring device as claimed in any one of the preceding claims,  
15 further comprising a deceleration device for reducing high deceleration forces.

22. A portable measuring device as claimed in claim 21, wherein the deceleration device includes a compressible element.

20 23. A portable measuring device as claimed in any one of the preceding claims, further including an audible sounder for providing an audible indication of when preliminary measurements at said first or second locations have been recorded.

24. A portable measuring device as claimed in any one of the preceding claims,  
25 wherein said power supply means comprises connectors adapted for power connection to a portable power source.

25. A portable measuring device as claimed in claim 24, wherein the portable power source consists of a battery.

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26. A portable measuring device as claimed in any one of the preceding claims, wherein the processor is adapted to supply real time data on the measured relative spatial separation.

27. A portable measuring device as claimed in any one of the preceding claims, wherein said first location, from which the spatial separation of said second location is determined, is selected from a reference point, a reference line or a reference plane.

5 28. A portable measuring device as claimed in any one of the preceding claims, wherein the processor additionally includes a data store in which motion data is stored.

29. A portable measuring device as claimed in 28 and any one of claims 9, 12 or  
10 13, wherein said processor is adapted to update said stored motion data in dependence on calculated error corrections or updated calibration data and to recalculate said measured spatial separation in dependence on the updated motion data.

30. A portable measuring device as claimed in any one of the preceding claims,  
15 further including a non-contact distance meter for measuring a distance to a position remote from the measuring device, the position being at least one of said first and second locations.